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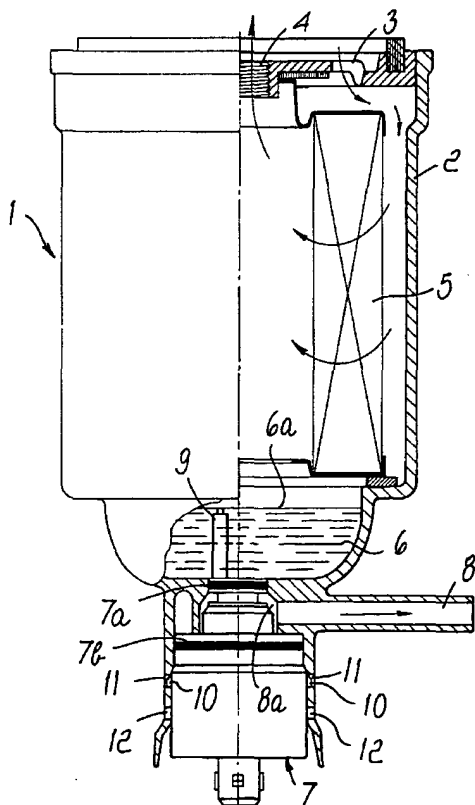
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(54) Title: **FILTER FOR DIESEL ENGINE FUEL**



(57) Abstract: A filter (1) for Diesel engine fuel comprising a filtering mass (5) which is contained within an enclosure (2) so as to be crossed by the fuel in its path inside the filter (1) between an intake connector (3) and a discharge connector (4), the filtering mass (5) being provided with provisions for separating the water contained in the Diesel fuel. The enclosure (2) comprises a water collection chamber (6) at the bottom thereof. The filter (1) comprises a pilot-operated valve (7) which is associated with the bottom of the enclosure (2) and is adapted to control a duct (8) for conveying the water to a specifically provided container. The valve (7) has at least one built-in-water level sensor (9) adapted to control the system that operates the valve (7).



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

## FILTER FOR DIESEL ENGINE FUEL

### Technical Field

The invention relates to a filter for Diesel engine fuel.

### Background Art

5 It is known that filters inserted on the supply circuit of Diesel engine fuel, commonly known as Diesel fuel, comprise, inside an enclosure, a filtering mass provided with means adapted to separate the water contained in said fuel: while the Diesel fuel circulates inside the filter between an intake connector and a discharge connector, encountering such filtering  
10 mass, the separated water collects on the bottom of the enclosure of the filter in order to be evacuated periodically.

Accordingly, for this purpose there is a duct for connection to an appropriately provided container which is controlled by a pilot-operated valve, such as an electric or a pneumatic valve, activated by a sensor which  
15 has an independent surface and which, by detecting that the water has reached a maximum level, sends an opening command to such valve; when the minimum level is reached, the same sensor, or a different one, sends a closure command in order to prevent the escape of Diesel fuel.

Any anomaly in the pilot-operated valve is indicated by a warning  
20 indicator on the vehicle dashboard which lights up and remains lit when the sensor detects the presence of water; in normal operation, such an indicator switches off immediately after the valve has opened, with a consequent drop in the level of water.

### Disclosure of the Invention

25 In the prior art, the installation of a system as described above burdens significantly the cost of the entire filter; accordingly, the aim of the present invention is to provide a filter for Diesel engine fuel in which the installation of the pilot-operated valve with the corresponding sensor achieves a limited cost.

30 Within this aim, an object of the invention is to provide a filter which

allows to simply and rapidly remedy any malfunctions of the pilot-operated valve and can be easily drained in any situation.

This aim and this and other objects which will become better apparent hereinafter are achieved by a filter for Diesel engine fuel, according to the invention, comprising a filtering mass which is contained within an enclosure and is designed to be crossed by the fuel in its path inside the filter between an intake connector and a discharge connector and is provided with means for separating the water contained in the Diesel fuel, said enclosure comprising a water collection chamber at the bottom, characterized in that it comprises a pilot-operated valve which is associated with the bottom of the enclosure and is adapted to control a duct for conveying the water to a specifically provided container, such valve having incorporated therein at least one water level sensor which is adapted to control the system that operates the valve.

#### Brief description of the drawings

Further characteristics and advantages of the invention will become better apparent from the description of two preferred but not exclusive embodiments of the invention, illustrated only by way of non-limitative examples in the accompanying drawings, wherein:

Figure 1 is a partial sectional view of the filter according to the invention in normal operation;

Figure 2 is a view of a portion of the filter according to the invention in a different condition;

Figure 3 is a view of a portion of the invention according to another embodiment.

#### Ways to carrying out the Invention

With reference to Figures 1 and 2, the reference numeral 1 generally designates a filter which comprises a per se known structure which is adapted to determine, inside the enclosure 2, the circulation of the Diesel fuel indicated by the arrows in the figure between the intake connector 3

and the discharge connector 4, passing through the filtering mass 5; the water contained in the Diesel fuel is retained by an appropriately provided means, not shown in the figure, which is comprised within the filtering mass 5, and falls into the water collection chamber 6 provided at the bottom of the enclosure 2.

The reference numeral 7 further designates an electric valve which is associated, by means of a bayonet coupling, with the bottom of the enclosure 2 so as to control the duct 8 for conveying the water to an appropriately provided container and is provided with the variable-resistance sensor 9 incorporated therein and sends a signal to the system that operates the valve in order to actuate the opening of the valve, with consequent passage of the water into the portion of space 8a, which gives access to the duct 8, when the water reaches the maximum level 6a shown in the figure, and sends a valve closure signal when the water reaches the minimum level, so as to avoid escape of Diesel fuel.

It is noted first of all that the system that operates the electric valve 7 can equally be comprised within the control devices installed on board the vehicle equipped with the filter or be incorporated within the electric valve proper.

The normal operating condition is shown in Figure 1: the electric valve 7 is arranged so that the reference teeth, such as 10, are inserted in the slots, such as 11, which are formed in a protrusion of the enclosure, and the gasket 7a ensures watertightness between the collection chamber 6 and the portion of space 8a that gives access to the duct 8.

In case of malfunction of the electric valve 7, indicated by a warning light on the dashboard of the vehicle on which the filter is installed, or for example when the filter is disassembled, the user proceeds manually, causing the lowering of the electric valve to the position shown in Figure 2, with insertion of the teeth such as 10 in the slots such as 12, thus clearing the connection between the collection chamber 6 and the portion of space

8a, so as to allow the water to escape through the duct 8; in this step the gasket 7b is active.

In the embodiment shown in Figure 3, the only variation with respect to what has been described above consists in that the electric valve 13 is  
5 provided with two built-in sensors, specifically the sensor 14, which detects the maximum level of the water in the collection chamber 6 and sends a signal for opening the electric valve, and the sensor 15, which sends a signal for closing the electric valve when the minimum level is reached.

The described invention is susceptible of numerous other modifications  
10 and variations, all of which are within the scope of the appended claims: thus, for example, the electric valve can be replaced with a pilot-operated valve of any kind, such as for example a pneumatic valve.

The pilot-operated valve may also control the water conveyance duct when it is in the lowermost position of its stroke and the connection  
15 between the bottom of the container and said duct can be opened by moving said valve to the uppermost position.

The valve can further be stably associated with the bottom of the filter, and in this case its flow control element can be provided with manual actuation means for interventions in case of malfunction.

20 In the practical execution of the invention, all the details may be replaced with other technically equivalent elements; the materials used, as well as the shapes and the dimensions, may further be any according to requirements.

The disclosures in Italian Patent Application No. MI2000A001311 from which this application claims priority are incorporated herein by reference.

CLAIMS

1. A filter for Diesel engine fuel, comprising a filtering mass (5) which is contained within an enclosure (2) and is designed to be crossed by the fuel in its path inside the filter between an intake connector (3) and a discharge connector (4) and is provided with means for separating the water contained  
5 in the Diesel fuel, said enclosure (2) comprising a water collection chamber (6) at the bottom, characterized in that it comprises a pilot-operated valve (7) which is associated with the bottom of the enclosure (2) and is adapted to control a duct (8) for conveying the water to a specifically provided  
10 container, the valve (7) having incorporated therein at least one water level sensor (9) which is adapted to control the system that operates the valve (7).

2. The filter according to claim 1, characterized in that the pilot-operated valve (7) comprises a built-in variable-resistance sensor (9) which is adapted to send to the system that operates the valve (7) a maximum water  
15 level signal and a minimum water level signal so as to actuate the opening and the closure of said valve (7), respectively.

3. The filter according to claim 1, characterized in that the pilot-operated valve (7) comprises a built-in maximum water level sensor (14) and a built-in minimum water level sensor (15) which are adapted to send to the system  
20 that operates the valve (7) a signal for opening and closing said valve (7), respectively.

4. The filter according to one or more of the preceding claims, characterized in that the pilot-operated valve (7) is an electric valve with a driving system which is comprised within the control devices installed on  
25 board the vehicle equipped with the filter (1).

5. The filter according to one or more of the preceding claims, characterized in that the pilot-operated valve (7) is an electric valve with a control system which is built into said valve (7).

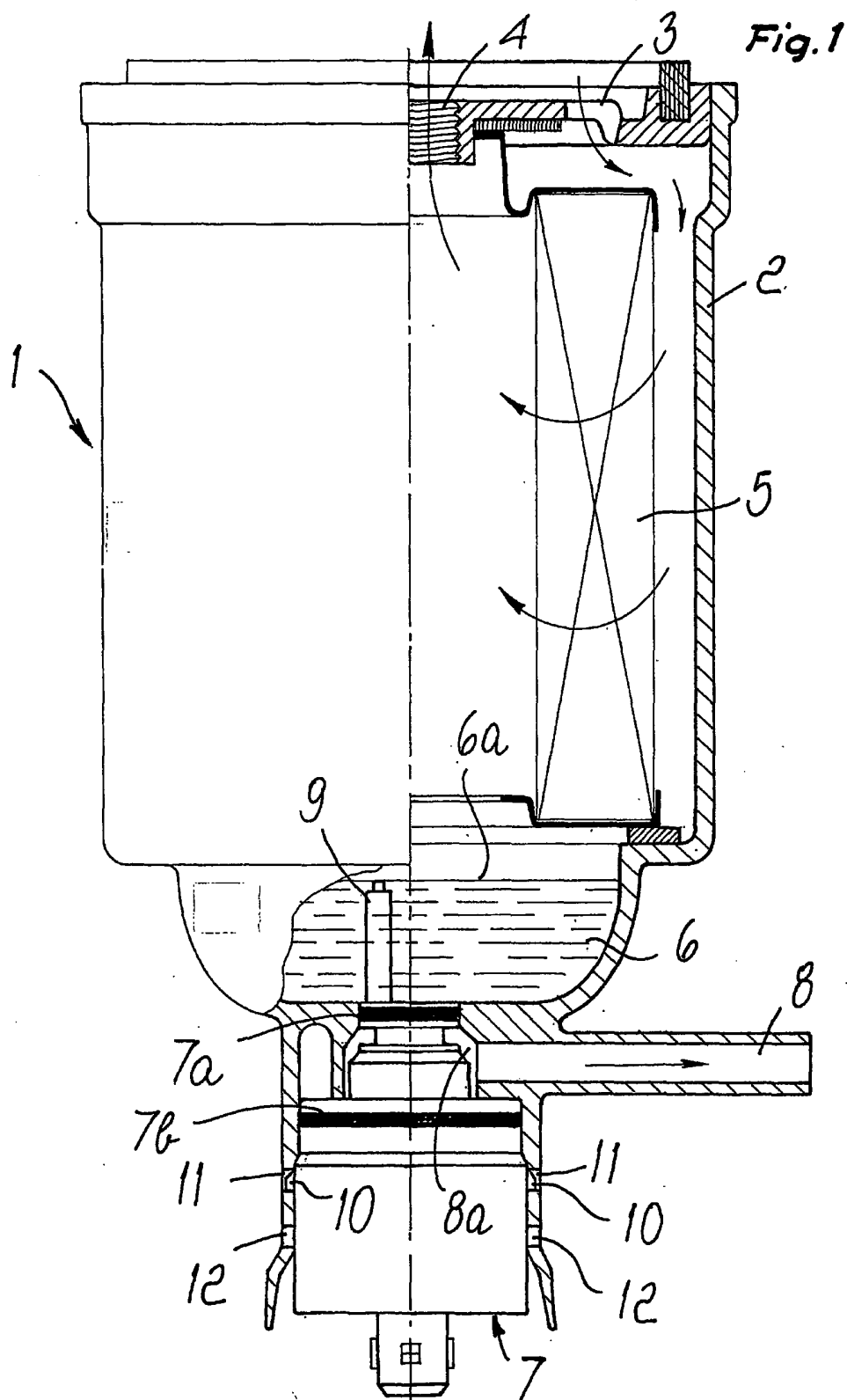
6. The filter according to one or more of the preceding claims,  
30 characterized in that the pilot-operated valve (7) is associated with the

bottom of the enclosure (2) of the filter (1) and is movable by manual actuation between two end positions, respectively for blocking the water conveyance duct (8) and for opening the connection between the bottom of the enclosure (2) and said duct (8).

- 5      7. The filter according to one or more of the preceding claims, characterized in that the pilot-operated valve (7) is stably associated with the bottom of the enclosure (21) of the filter (1) and its flow control element (7a, 7b) is provided with manual actuation means.



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2/2

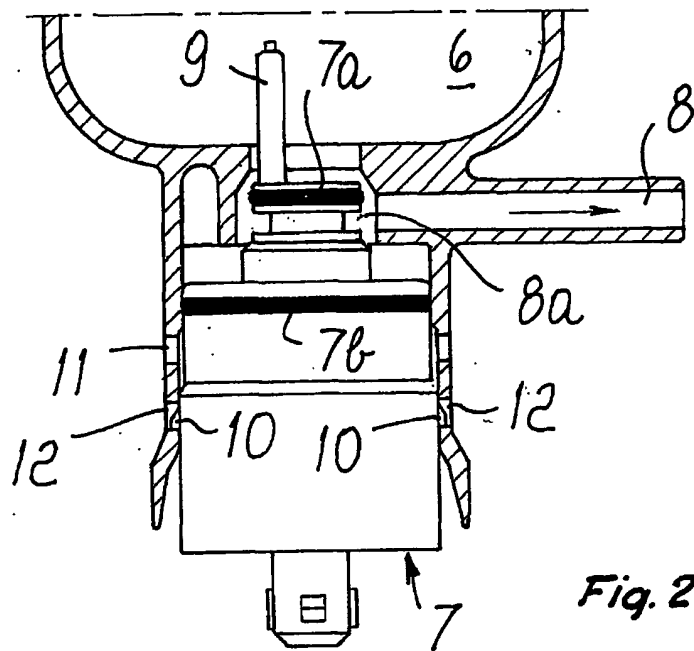
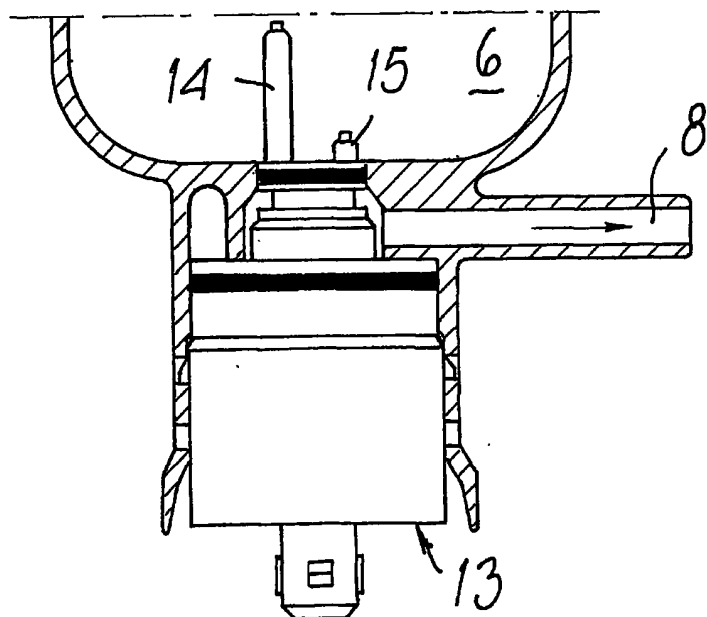


Fig. 3



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## A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 047 108 A (TOKYO ROKI) 26 November 1980 (1980-11-26)	1,4
Y	abstract page 1, line 114 -page 2, line 28 page 2, line 35 - line 42; figure 1	2,3
Y	PATENT ABSTRACTS OF JAPAN vol. 008, no. 146 (M-307), 7 July 1984 (1984-07-07) & JP 59 041654 A (TSUCHIYA SEISAKUSHO:KK), 7 March 1984 (1984-03-07) abstract	2,3
Y	EP 0 150 120 A (DAVCO) 31 July 1985 (1985-07-31) page 6, line 18 - line 27 page 7, paragraph 4 -page 9, paragraph 1; figure 3	1-4
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 32 12 963 C (KNECHT FILTERWERKE) 22 December 1983 (1983-12-22)	1-4
A	column 2, line 13 - line 52; figure 1	7
P,X	EP 1 081 371 A (ITALIANO) 7 March 2001 (2001-03-07) column 2, line 34 - line 41 column 3; line 24 - column 4, line 12; claims 1-3,8; figure 1	1,2,5
A	EP 0 106 737 A (FRAM) 25 April 1984 (1984-04-25) abstract page 5, line 13 - page 6, line 8 page 7, line 20 - page 8, line 7; figure 5	1
A	DE 37 01 259 A (VW) 30 July 1987 (1987-07-30) column 3, line 39 - line 50; figure 1	1,5

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 01/06393

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2047108	A	26-11-1980	DE 3009899 A1	25-09-1980
JP 59041654	A	07-03-1984	NONE	
EP 150120	A	31-07-1985	US 4539109 A	03-09-1985
			CA 1245569 A1	29-11-1988
			EP 0150120 A2	31-07-1985
			JP 60159362 A	20-08-1985
			US 4680110 A	14-07-1987
DE 3212963	C	22-12-1983	DE 3212963 C1	22-12-1983
EP 1081371	A	07-03-2001	IT ME990006 A1	02-12-1999
			EP 1081371 A2	07-03-2001
EP 106737	A	25-04-1984	US 4470301 A	11-09-1984
			CA 1202400 A1	25-03-1986
			EP 0106737 A2	25-04-1984
			ES 525839 D0	01-07-1984
			ES 8406215 A1	01-11-1984
			JP 59077070 A	02-05-1984
			NZ 205601 A	10-09-1986
			SU 1276267 A3	07-12-1986
DE 3701259	A	30-07-1987	DE 3701259 A1	30-07-1987